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Exploring teleconsultation acceptance: a comparison study between emergency and non-emergency setting

Nurazean Maarop
University of Technology Malaysia, nm317@uowmail.edu.au

Khin Than Win
University of Wollongong, win@uow.edu.au

Maslin Masrom
University of Technology Malaysia, maslin@ic.utm.my

Sukdershan Singh Hazara Singh
Ministry of Health, Malaysia, sukdershan@gmail.com

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Abstract

This research explores the acceptance of teleconsultation technology among healthcare providers of public hospitals in Malaysia. Primary constructs from Davis' Technology Acceptance Model (TAM) are employed for this purpose. Further, the study also compares the level of user acceptance between emergency and non-emergency setting. This study is based on descriptive statistic and correlation analysis served as preliminary exploration of the acceptance of the technology understudy. The study reports a high level of acceptance of teleconsultation technology in both emergency and non-emergency settings thus exhibits no significant difference in acceptance the acceptance of teleconsultation technology for both respective settings. The results indicate that the acceptance of teleconsultation is moderately correlated with perceived usefulness of the technology thus not even significant to perceived ease of use suggesting more rigorous research efforts should be carried out to uncover other external contextualized factors which may have existed in teleconsultation acceptance and adoption. Overall, the findings are useful in providing a preliminary foundation for future teleconsultation adoption studies in the relevant context.

Keywords

Exploring, teleconsultation, acceptance, comparison, study, between, emergency, non, emergency, setting

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Nurazean Maarop
Advanced Informatics School
University of Technology Malaysia
Kuala Lumpur, Malaysia
e-mail: nurazean@ic.utm.my

Khin Than Win
Faculty of Informatics
University of Wollongong
NSW, Australia
e-mail: win@uow.edu.au

Maslin Masrom
School of Engineering and Advanced Technology
University of Technology Malaysia
Kuala Lumpur, Malaysia
e-mail: maslin@ic.utm.my

Sukdershan Singh Hazara Singh
Telehealth Division
Ministry of Health, Malaysia
Putrajaya, Malaysia
e-mail: drsukdershan@moh.gov.my

Abstract—**This research explores the acceptance of teleconsultation technology among healthcare providers of public hospitals in Malaysia. Primary constructs from Davis' Technology Acceptance Model (TAM) are employed for this purpose. Further, the study also compares the level of user acceptance between emergency and non-emergency setting. This study is based on descriptive statistic and correlation analysis served as preliminary exploration of the acceptance of the technology understudy. The study reports a high level of acceptance of teleconsultation technology in both emergency and non-emergency settings thus exhibits no significant difference in acceptance the acceptance of teleconsultation technology for both respective settings. The results indicate that the acceptance of teleconsultation is moderately correlated with perceived usefulness of the technology thus not even significant to perceived ease of use suggesting more rigorous research efforts should be carried out to uncover other external contextualized factors which may have existed in teleconsultation acceptance and adoption. Overall, the findings are useful in providing a preliminary foundation for future teleconsultation adoption studies in the relevant context.**

Keywords- acceptance; adoption; teleconsultation; health IT; telemedicine;

I. INTRODUCTION

The recent introduction information technology (IT) in health care certainly has tremendously enhanced health care quality and service delivery. There are many types of health applications used in health care sector. One of the most emerging applications proven to be beneficial to hospital management and patients' health outcome is telemedicine. Telemedicine is defined as the integration of information telecommunication, human-machine interface technologies and health technologies to deliver health care, to promote the health status of the people and to create health [1]. It provides healthcare facilities, clinical information and education over a distance [2]. Teleconsultation is one of the main components of telemedicine serviced as communicational and interaction platform between two or more health care professionals. In Malaysia, this includes consultation and referral over electronic platform engaging at least two health professionals communicating about disease and patient management that takes place between primary (also secondary) and tertiary health care facilities respectively.

According to health vision of MOH Malaysia, the telemedicine application was anticipated to be promoting good health and preventing morbidity and mortality [3]. Subsequently, the new teleconsultation was launched in early 2010 involving 38 MOH hospitals and indeed its potentials should be realized and aligned correspondingly. Prior to adoption into routine use, the technology has to be proved to be superior to the conventional method it is intended to replace [4]. Nonetheless, at the national level, there is no thorough study has been conducted to explore the potential and acceptance of teleconsultation technology particularly from the perspective of health care providers who practice at the participating hospitals. Telemedicine implementation is costly. It is the hope of MOH Malaysia to turn teleconsultation into an integral part of the healthcare delivery system in the country, which will facilitate more equitable, accessible and affordable delivery of health care. Therefore, the study is relevant as the outcome can be of importance to project implementer, MOH, national health care, and theoretical advancement. Physicians are the end-users of teleconsultation technology and their acceptance is often crucial to technology implementation success [5].

Above and beyond, physicians' acceptance of telemedicine technology represents the most important challenge for telemedicine continuance [6]. In particular, the physicians' acceptance of telemedicine represents the vital part for its diffusion on a national scale [7]. For that reason, there is a need to develop an in-depth understanding concerning the acceptance and adoption of the new teleconsultation technology in the Malaysian health care

context. In this study we employed Technology Acceptance Model (TAM) to investigate the acceptance of the recent teleconsultation technology that was implemented in stages in 2010. Therefore, the objectives of this study are to (1) explore the acceptance of teleconsultation technology and (2) compare the level of acceptance between emergency and non-emergency setting.

II. RESEARCH MODEL

According to Dillon & Morris [8], acceptance is the willingness within a user group to employ information technology to the tasks it is designed to support. Nowadays, many researchers have been interested in factors that explain the acceptance and use of different technologies. TAM that was proposed by Davis [9] has been used in a number of studies to explain user acceptance. TAM has become evident as one of the most influential theories in Information Systems [10]. TAM suggests that when users are presented with new software, a number of factors would influence their decision about how and when they will use it. The original version of TAM [9] is shown in Figure 1.

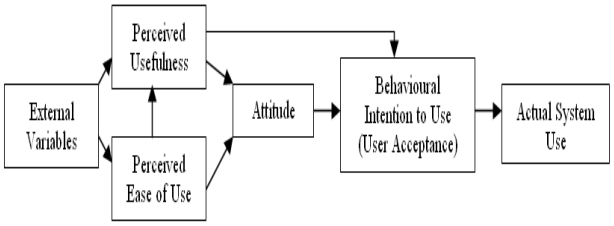

Figure 1. Original Version of TAM.

TAM has been revised and extended to suit the purposes of many other studies according to their contextual needs. Accordingly, the basic research model used in this study is shown in Figure 2 which supports the objective of this study, to explore the acceptance of the recent version of teleconsultation technology and to compare the level of acceptance between emergency and non-emergency setting. As the intention of this study was merely to explore the acceptance of the new teleconsultation technology which focuses on the outcome of the intention to use, we followed the intention-based approach thus we did not consider attitude in our research model. Further, attitude is a partial mediator between perceived usefulness and behavioral intention. Moreover, attitude is a complex construct thus is not so consistent as compared to behavioral intention in measuring acceptance [11]. We used behavioral intention (BI) as a surrogate to actual utilization behavior since behavioral intention is the best indicator of system usage [11] and often replaced with user's actual behavior towards system use [12]. Further, as the data were collected during the stage when the new teleconsultation technology was recently implemented, it was hard to obtain the data pertaining to the actual system usage.

Specifically, two primary constructs from TAM were employed in this study. These were perceived usefulness (PU) and perceived ease of use (PEOU). PU was defined as the degree to which a person believes that using a particular system would enhance his or her job performance [9]. PEOU was defined as the degree to which a person believes that using particular system would be free from effort [9]. BI was used as a measure of strength of one's intention to perform a specific behavior, that is, use an information system [9].

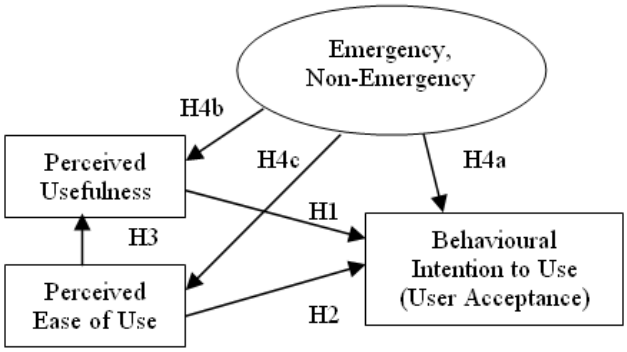

Figure 2. Research Model.

The research hypotheses are as follows (in the form of null hypothesis statement):

Hypothesis 1 (H1): There is no correlation between perceived usefulness and user acceptance.

Hypothesis 2 (H2): There is no correlation between perceived ease of use and user acceptance.

Hypothesis 3 (H3): There is no correlation between perceived ease of use and perceived usefulness

Hypothesis 4(a) (H4a): Level of user acceptance for emergency and non-emergency setting is the same.

Hypothesis 4(b) (H4b): Level of perceived usefulness for emergency and non-emergency setting is the same.

Hypothesis 4(c) (H4c): Level of perceived ease of use for emergency and non-emergency setting is the same.

III. RESEARCH METHODOLOGY

We employed self self-response questionnaire as our research methodology. The data collection procedure took place concurrently between March 2010 and July 2010. Ethics approval and consents were firstly obtained before proceeding to data collection since the research involved study of human behavior in health care environment. Research ethics were approved by Institute for Health Behavioral Research (IHBR) MOH Malaysia and MOH Research and Ethics Committee (MREC) Malaysia. Of 38 participating hospitals involved in the MOH teleconsultation project, only 11 hospitals involved in this study since the majority of other hospitals were still in midst of technical arrangement for the completion of system installation with the relevant vendor.

The purposive sampling was applied involving health care providers to respond to the survey questions. In this study, in terms of ensuring instrument and content validity, pilot study was performed on several selected participants to

test the use of the survey instruments so that the feedback can be used to make modifications to the instrument [13]. Subsequently, the questionnaire was distributed to 12 teleconsultation users and experts. As a result, there was no item being eliminated and all of the questions were completely answered. According to the participants contact list released by the respective department of MOH Malaysia during our preliminary study, we identified a target sample of 165 health providers from a target population who we felt qualified to participate in the survey involving 11 participating hospitals. Consequently, we received 72 valid questionnaires (response rate of 43.6%). A questionnaire using a 7-point likert scale of 1 (Strongly Disagree) to 7 (Strongly Agree) with 4 as a mid-point score was employed to collect the corresponding data.

IV. RESULT

The questionnaires were distributed to only the existing users of the technology and personnel who have attended teleconsultation training. The findings reported in this study are based on the responses of the participants with the following profiles (n=72): 43.1% medical officers, 25% of specialists and 31.9% of medical assistants and radiographers. Further, of 72, 58.3% (n=42) and 41.6% (n=30) are participants who practice in the emergency and non-emergency department respectively. Due to the limitation of sample size, we employed descriptive and correlation analyses. The size of the sample precluded the use of power analysis such as factor analysis. Data from the survey were analyzed using SPSS Version 17.0 for Windows. The presentation of the findings is organized according to the respective analysis used in this study namely Reliability Coefficient, Correlation Coefficient and Mann-Whitney U test.

A. Reliability of Measurement and Frequency Analysis

Cronbach's alpha (α) was used to measure the reliability of the instrument items [14]. Table I provides a summary of the reliability analysis.

TABLE I. CRONBACH ALPHA AND OVERALL MEAN

Scale (Item)	Cronbach's alpha (α)	Overall Mean
BI (3)	.854	6.287
PU (6)	.881	6.287
PEOU (5)	.868	5.936
Overall (14)	.887	6.148

The measurement items were developed based on the measurements obtained from previously tested item [15, 16] and further modified according to the context of Malaysian health care environment. Consequently, the reliability of all measurement scales were above the recommended minimum level of 0.70 [17] and in fact above the desirable level of 0.80 for social science research [18]. Based on the results in Table I, the participants reported high level scores of acceptance, perceived usefulness and perceived ease of use.

B. Correlation Coefficient

The pair wise correlation was used to indicate the relationships between two or more variables, including the strength and direction [19]. Prior to calculating correlation coefficient, the assumption of normality was tested. Subsequently, the computation of Spearman's correlation coefficient (r_s) was performed on the data as the data have violated the normality assumption [19]. The result is shown in Table II.

TABLE II. CORRELATION COEFFICIENT (SPEARMAN'S)

		BI	PU	PEOU
BI	Correlation Coefficient	1		
	Sig. (2-tailed)			
	N	72		
PU	Correlation Coefficient	.428**	1	
	Sig. (2-tailed)	.000		
	N	72	72	
PEOU	Correlation Coefficient	.205	.620**	1
	Sig. (2-tailed)	.084	.000	
	N	72	72	72

**. Correlation is significant at the 0.01 level (2-tailed)

Spearman's coefficient (r_s) indicated that the correlation between both perceived usefulness and ease of use and behavioral intention were not considerably strong (both $r_s <$ .50). According to Cohen [20], r_s of .30 - .50 represents a medium correlation whereas r_s of .50 or larger represents a strong correlation. Particularly, perceived ease of use was indeed not adequately significant ($p > 0.05$). This signified that the acceptance of teleconsultation technology was not really desirably correlated with perceived ease of use but acceptably correlated with perceived usefulness. However, the results also indicated that perceived usefulness was strongly and positively correlated with perceived ease of use. Accordingly, null H1 and H3 were rejected, indicating there were positive relationships between acceptance and perceived usefulness as well as between perceived usefulness and perceived ease of use. On the other hand, null H2 was accepted, indicating there was no relationship between perceived ease of use and acceptance.

C. Mann-Whitney U test

Mann-Whitney U test is a non-parametric test used to analyze the difference between the medians [19] of emergency (EM) and non-emergency (N-EM) settings' samples concerning BI (acceptance), PU and PEOU. The result is shown in Table III. In the context of this study, emergency setting involves acute emergency patients requiring brain or spine attention (in the case of neurosurgery) and acute chest pain (in the case of

cardiology) that require urgent specialist intervention and shall be admitted. On the other hand, non-emergency setting involves patients who are likely to be treated under routine management as outpatients such that they would visit a hospital or clinic that provides teleconsultation facilities for diagnosis or treatment to seek for medical advice and treatment and shall not be admitted.

TABLE III. EMERGENCY VS NON-EMERGENCY

Scale	Setting	N(72)	Mean Rank	Asymp. Sig
BI	EM	42	37.67	.561
	N-EM	30	34.87	
PU	EM	42	36.51	.995
	N-EM	30	36.48	
PEOU	EM	42	37.37	.671
	N-EM	30	35.28	

Notes: N Asymp. Sig. (2-tailed), confidence level (95%), α(.05)

All probability values (Asymp. Sig for BI, PU and PEOU) were larger than the predetermined alpha value (.05). Hence, all the null hypotheses of H4a, H4b and H4c were failed to be rejected. Therefore the results provide no evidence to suggest that there are significant differences in the participants' responses concerning teleconsultation acceptance, perceived usefulness and perceived ease of use between the emergency and non emergency settings. This conclusion is made at the confidence level of 95%.

V. DISCUSSION AND CONCLUSION

As a whole, teleconsultation technology has been accepted as an effective delivering tool in health care environment in Malaysia both in emergency and non-emergence settings. This conclusion is made based on the high level of behavioral intention to use the technology. In addition, there is not enough evidence to show that there is difference in the users' behavioral intention for emergency and non-emergency settings. Likewise, this also applied on perceived usefulness and perceived ease of use. Behavioral intention was used as an indicator to system usage and acceptance as the data were collected during the stage when the new teleconsultation technology was recently implemented. Indeed, when the target technology has not been entirely implemented, measuring actual use may necessitate a proper longitudinal endeavor [21] and this cannot be realized due to time and budget limitation.

The TAM model was employed addressing two primary scales namely perceived usefulness and perceived ease of use to explore the possible relationships towards the acceptance of teleconsultation technology in MOH hospitals. Although TAM was used fairly convincing in explaining physicians' acceptance and utilization of health IT, the actual barriers and facilitators to technology use were still not covered suggesting a more rigorous research effort should be carried out to uncover specific, contextualized, and actionable constructs that may have existed in health IT diffusion [21]. This is consistent with the result of this study as the finding indicates that the acceptance of teleconsultation is moderately correlated with perceived usefulness of the teleconsultation thus not even significant to perceived ease of use of teleconsultation. As a whole, the study is useful in providing a preliminary foundation for future teleconsultation adoption studies in the relevant context.

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